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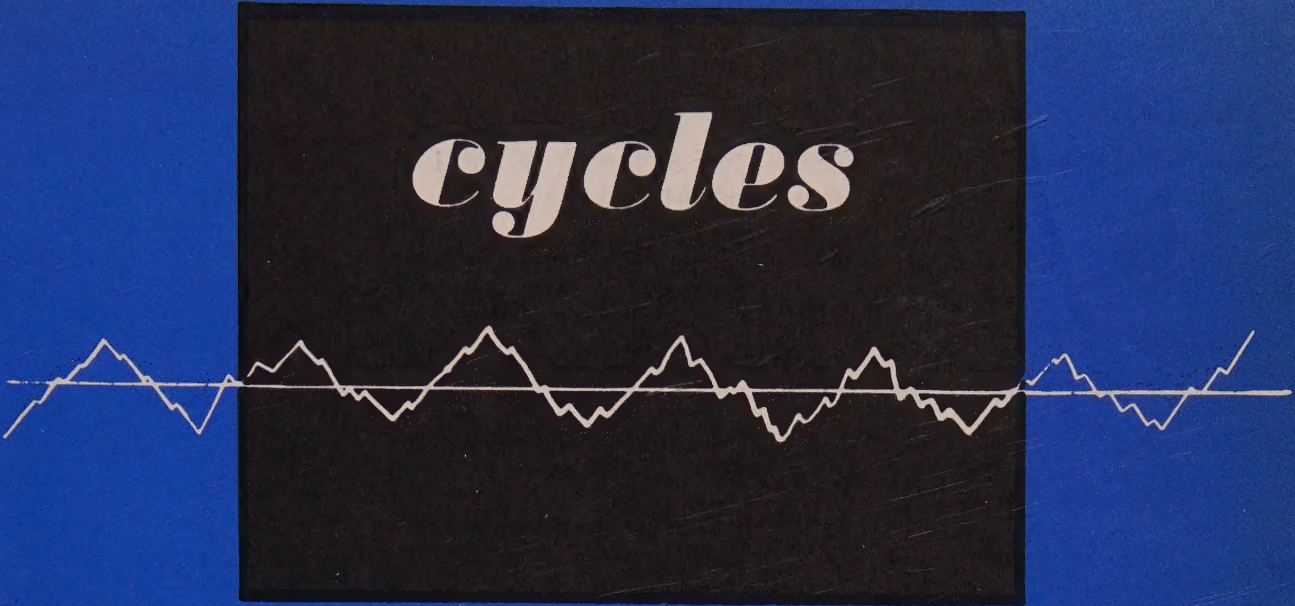

July 1957

FOUNDATION FOR THE STUDY OF CYCLES
New York, New York

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VOLUME VIII NUMBER 7 JULY 1957

THE DIRECTOR'S LETTER

Dear Member:

Stock Prices

I have audited another stock market cycle. It is the one I formerly called 12.0 years. Now, as a result of a good deal of work, it looks to be 12.8 years.

Insofar as the 11 cycles have been audited there is no change in the ideal date of the next low (1960) or of the high to follow (1964). Bear in mind however that the synthesis includes only cycles 4 years long and longer. Until we get into shorter cycles we can expect only general orientation, not exact years.

To get an idea of how I went at it to find the length of 12.8 years, read Part XIII of the Postscript to *Cycles--The Science of Prediction,* which starts on page 177. To modify an old saying, "The longest way around is the safest way home!" When you have read this postscript you can see why I can't do the auditing job overnight.

Commodity Prices

I rather liked the article on corn prices in last month's *Cycles.* It gave you the *odds* that this or that would happen. I plan more articles like that. All cycle work should be read in terms of odds.

Book on Trends

The book on trends is coming on. Chapter 2 is published in this issue. Chapter 3 will start getting into growth trends of American industry. It is *most* important to know about growth trends. They are the axes around which the cycles oscillate.

Book on Cycles

Progress is being made with the book about cycles, too. That book will take some time to complete. It will not be published serially, but eventually will come out between boards.

How to Make a Cycle Analysis

So far we have sold 44 sets of "How to Make a Cycle Analysis."

I am sorry the price has to be so high ($50.), but even so, we are still out-of-pocket about $675 in connection with its publication. We will break even when we sell 15 or 16 more sets.

Every person and firm interested in the techniques of cycle analysis should send for this material. Take ten days to go over it. If *for any reason* you are not satisfied, you can return it for full refund. So far only one book has come back. Offsetting this, one man voluntarily sent in an extra $50!

Cordially yours,

Edward R. Dewey

Director

THE COMBINATION OF 11 STOCK MARKET CYCLES AND TREND

As you know, as fast as possible I am auditing my stock market work of 1944. That is, I am re-examining each of the cycles found at that time to try to get the length, strength, and timing more accurately.

Here for comparison are all the cycle lengths as determined in 1944 and the lengths as revised in 1956 and in 1957.

Original Length	Revised Length
4.89	not yet audited
5.50	not yet audited
6.07	5.91
6.86	not yet audited
8.17	8.17
9.2	9.18
11.0	not yet audited
12.0	12.8
14.5	not yet audited
21.0	22.0
--	27.0

The chart below shows trend combined with one new (27-year) cycle, five revised cycles, and five cycles as determined in 1944 and not yet revised.

This chart differs from the chart printed in January 1957 in that this chart uses the revised values of the cycle which, in 1944, I called a 12-year cycle, Recent work, based on 13 additional years of figures and on work with other figures, shows this cycle to be 12.8 years long.

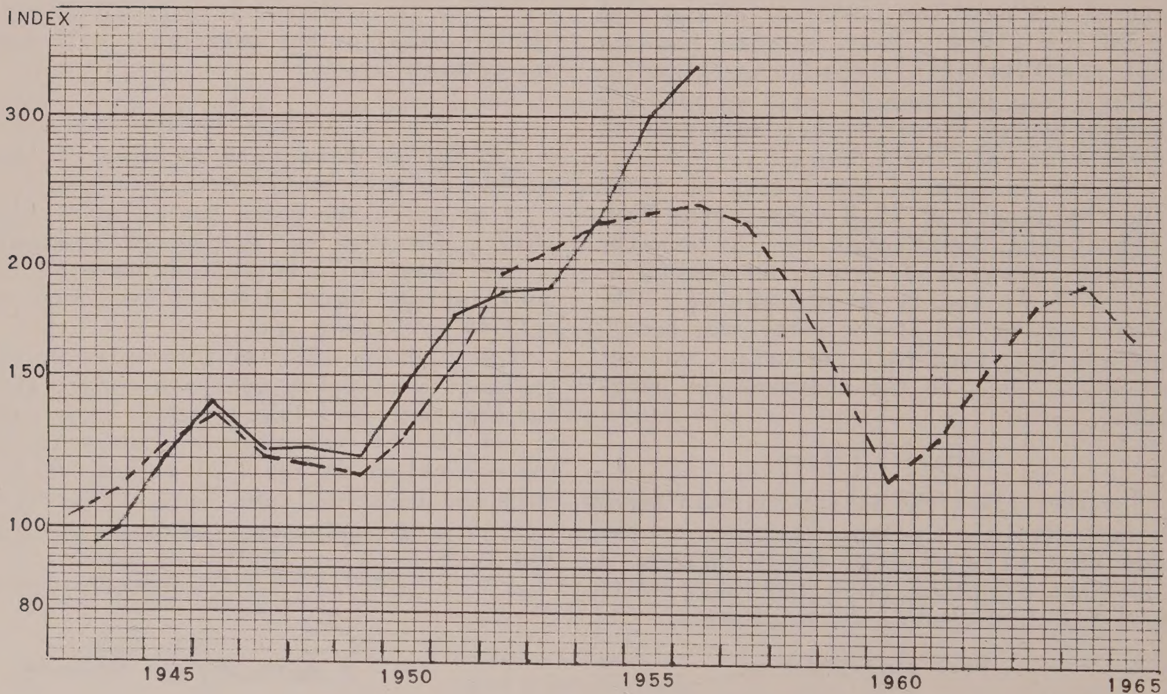
Of course this projection in no way includes the effects of inflation or other non-cyclic forces.

The revisions to date have not changed the date of the next low (1960) or of the high to follow (1964). They have however changed *amounts* of the various advances and declines.

Further changes are to be expected as the remaining five cycles are audited.

E. R. Dewey

June 3, 1957



Solid line; 1943--1956, Standard & Poor's Corporation Combined Stock Price Index (1935-39 = 100), as this index actually unfolded.
Broken line, 1943--1965, a combination of 5 cycles as determined in 1944, trend and a 27-year cycle as determined in 1956, and the 22-, 12.8-, 9.18-, 8.17-, and 5.91-year cycles as revised in 1956 and in 1957.

THE 1957 POSTSCRIPT

TO

CYCLES—THE SCIENCE OF PREDICTION

PART XIII: THE 12- TO 12.9-YEAR CYCLES

"WHAT have you been up to since I saw you last?" said my friend Robert Steele as we got together for one of our Sunday afternoon gab fests about cycles.

The 12- to 13-Year Cycles

"I've been trying to tie together what we know about cycles in the 12- to 13-year range." I answered.

"Are there many?"

"No, but they seem to be pretty important and in some cases they seem to be pretty clear."

"How did you get started on cycles of this particular length?" asked Robert.

The Audit

"The thing that built the fire under me was the need to re-examine the so-called 12-year cycle I had found way back in 1944 in common stock prices. As you know, I am going over all the work I did at that time to see if I can get the lengths, strengths, and the timings of the various cycles any more accurately. However, quite aside from the stock market, I am much interested in cycles of this general order of magnitude."

"Why?"

"For a variety of reasons. First of all, a cycle between 12 and 13 years long showed up importantly in a multiple harmonic analysis of cotton prices that I once made for a textile firm. Later I found a cycle of this length (between 12 and 13 years) in three different things: In copper prices, in the sales of a large manufacturing company for which I did some cycle analysis, and in some confidential figures given me by a New York financial house. C. N. Anderson of the Bell Telephone Laboratory had found cycles of about this length in sunspots with alternate cycles reversed. Sir William Beveredge had found the same thing in an analysis of 300 years of European wheat prices. All-in-all the 12- to 13-year range looked like a pretty good prospect for cycle study."

"When did you start trying to tie it up?"

"We did a little work on it last summer and some more in February of this year but we didn't really get into it with both feet until May."

"And you are finished now?"

"All except detailed reports on what we found out."

What We Found Out

"What *did* you find out?"

"Well, the full results are here:" See the table below.

"I don't like tables. Tell me what it says."

"All right, I will.

"The abundance of certain insects in Europe for 125 years is reported to have a 12-year cycle. Sir William Beveridge's study showed a 12.05-year cycle in European wheat prices for a 300-year period. A. E. Douglass found 12.0- and 12.1-year cycles in tree rings in Arizona pines near the Grand Canyon.

12.5-Year

"A cycle of about 12.5-years seems to be present in 200 years of international battle figures, in the sales of a manufacturing company for over 53 years, and in the 45-year series of confidential figures supplied me by the New York financial house.

12.6-Year

"The length seems to be 12.6 years in copper prices for 172 years and in sunspots with alternate cycles reversed for 207 years.

12.8-Year

"In railroad stock prices the length seems to be 12.8 years, and Beveridge found a second '12-year' cycle in wheat prices that is 12.8 years long, too."

"Does this mean that there are four different cycles, 12.0, 12.5, 12.6, and 12.8-years long respectively?" asked Robert.

Perhaps Three Cycles

"It could be, but I rather doubt it," I said. "There might be three lengths, though, one about 12 years, one about 12.5 or 12.6 years, and one about 12.8 years. On the other hand the 12.5-, 12.6-, and 12.8-year cycles may be all one and the same thing."

"Why do you think the differences between 12.5 or 12.6 and 12.8 don't mean too

---

Summary

12.0- To 12.9-Year Cycles

Ref.	Phenomena	Span of Years	Cycle Length	Time of Current Crest	Strength vs. Trend	
					Above	Below
1	Pine Moth, Nun Moth and Pine Sawfly	125	12.0	u	u	u
2	Arizona Tree Rings-Grand Canyon-Rim-Low		12.0	u	u	u
3	European Wheat Prices	300	12.05	u	u	u
2	Arizona Tree Rings-Cibacue		12.1	u	u	u
4	War-Professor R. H. Wheeler's Index of International Battles, 1751--1950	200	12.5p	1954.5	7.6%	7.1%
4	Sales of a Manufacturing Company (Co. G.)	53	12.5p	1954.5	35.2%	26.0%
5	Series "B" supplied by a New York Financial House	45	12.5p	1957.5	1.9%	1.8%
4	Copper Prices, 1784--1955	172	12.6	1953.5	8.1%	7.7%
4	Sunspots, Alternate Cycles Reversed, 1748--1955	207	12.6	1955.8	13. %	13. %
3	European Wheat Prices	300	12.8	u	u	u
4	Railroad Stock Price Index, 1831--1956	126	12.8	1953.9	7.2%	6.7%
4	Standard & Poor's Corporation Combined Index of Common Stock Prices. 1871--1956	85	12.8e	1953.9	10.9%	9.8%
4	Cotton Prices, 1731-2--1954-5	224	12.8e	1955.6	2.3%	2.3%

p preliminary (additional work might cause slight revisions in length, strength, or timing
u unknown
e estimated

much?"

"For one thing two of the 12.5-year lengths were found in series of figures so short--53 and 45 years long respectively--that any wave length determination closer than half a year either way is little more than fancy guessing. In either of these two cases the cycle could be 12, 12½, or 13 years long with almost equal ease.

Timing the Same

"A second reason for thinking that all of these cycles are possibly the same cycle is the fact that the *timing* of all the cycles (with one exception), is just about the same."

"What is the exception?"

"The series of confidential figures that had the 12.5-year length. However, that discrepancy does not bother me for the figures are merely the percentages that certain figures are of certain other figures, or some such derived series. There is no reason to think that a cycle in such figures would turn at the same time as a cycle in real phenomena such as sales, prices, and the like. Excluding this one unknown series, all of the phenomena have turning points which at the present time fall ideally within a bracket 2.1 years long. This is quite remarkable because, at random, the turning points could fall anywhere within a 12-year period. To have them bunch as they do suggests that the timing is not random. This in turn suggests that the cycle is not random."

Times of Crest

"Just when does this cycle crest?" asked Robert.

"I'll give you the ideal time of the current crest of each:

"For copper prices, 1953-5; for railroad stock prices 1953.9; for the combined stock price index 1953.9; for international battles 1954.5; for the sales of the

---

References

1. Eidman, H. A., *Proceedings of the Matamek Conference,* 1931, p. 142, as quoted in *Cycles,* May 1951, p. 169.
2. Douglass, A. E., 1927, pp. 67-76.
3. Beveridge, Sir William, H., "Wheat Prices and Rainfall in Western Europe." Tran. Roy. Astron. Soc. 85:412-78. London, 1922. Quoted in "Cycles in Wheat Prices and Weather," *Cycles,* Dec. 1953. p. 340.
4. Dewey, E. R., Not yet published.
5. Dewey, E. R.. Files of the Foundation (confidential not to be published).

manufacturing company 1954.5; for cotton prices 1955.6, and for sunspots with alternate cycles reversed 1955.8."

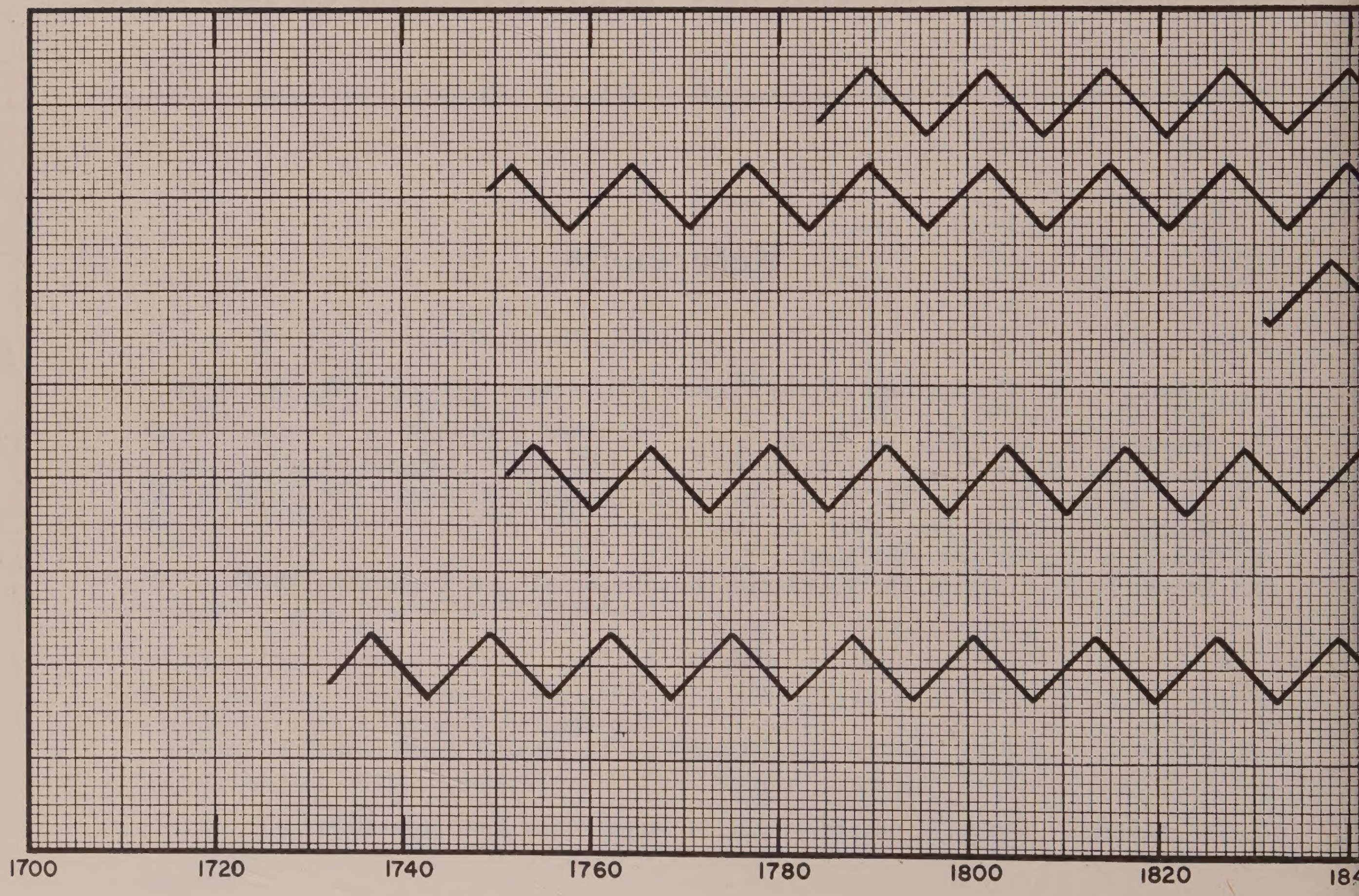
"You mentioned a 12-year cycle in European insects, in wheat prices, and in tree rings." said Robert.

"I don't know when those cycles crest."

"When you were talkihg about *length* you didn't mention combined stock prices or cotton prices."

"No, because I'm not sure of the exact length of this cycle in either of them. *Rail* stock prices have a cycle 12.8 years long, but the *combined* stock price index is so short that even with 13 more years of figures than I had in 1944 I can't pin it down precisely. There definitely is a cycle in combined stocks that is *about* this length and I am *assuming* that its length is the same as the length (12.8 years) found in rails, where I *can* measure it. If the 12- to 13-year cycle in combined stocks is 12.8 years long, it crests ideally in 1953.9, at the same time as the cycle in rails. This is another reason for thinking that the length in the combined index is probably the same as the length of the rail index.

A DIAGRAM OF THE 12.



This diagram illustrates the timing of the 12- to 12.9-year cycle in various phenomena, and the length of the series of figures in which it has been observed.

"As for cotton, in spite of the results of the harmonic analysis, I spoke of, I can't assure myself that a cycle of this length is even present! It's very weak and irregular. However *if* there is a cycle of this general order of magnitude and *if* it is 12.8 years long, it crests ideally at 1955.6, as stated."

"That sounds pretty nebulous." said Robert.

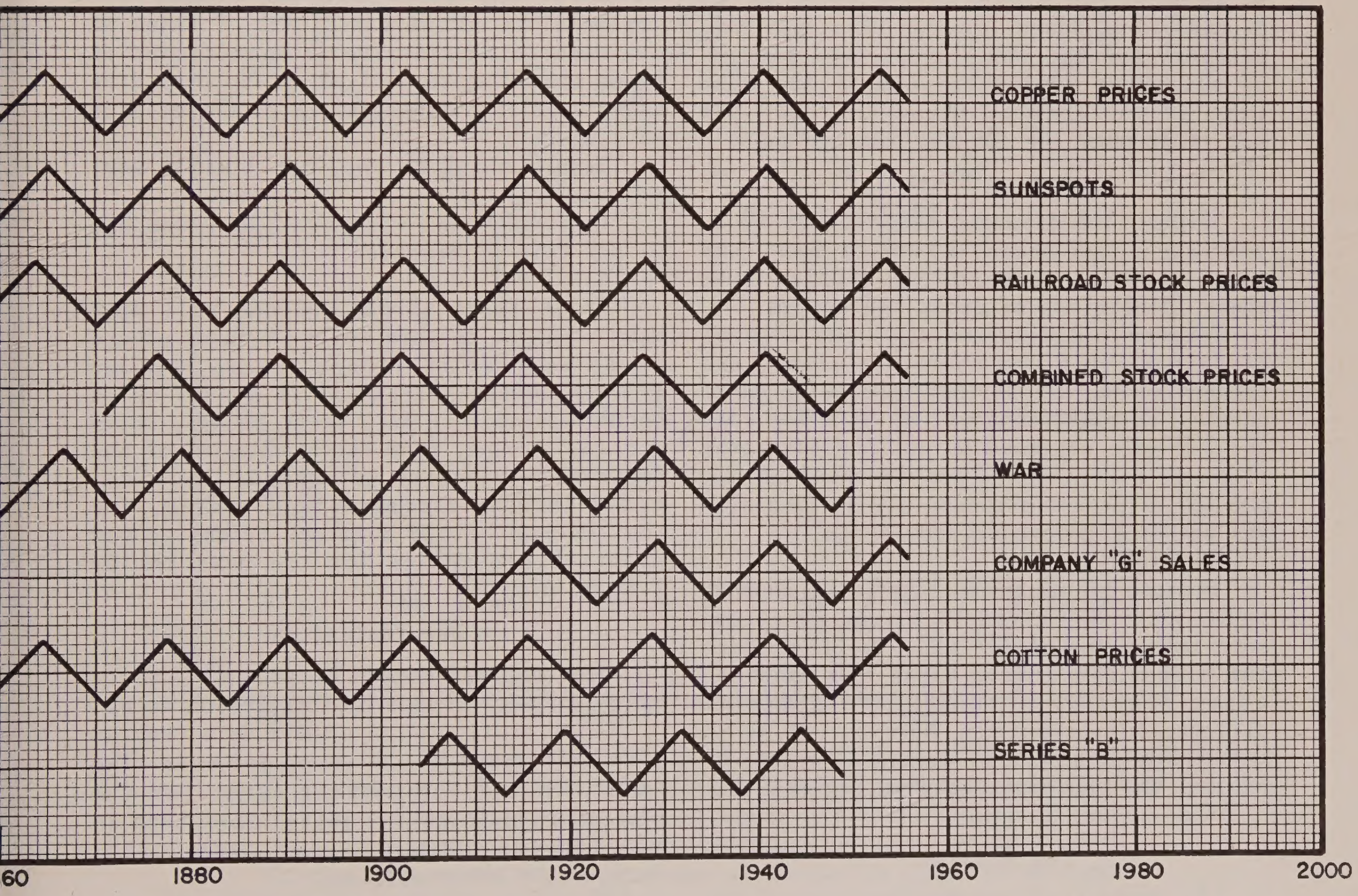
"It isn't as bad as it sounds, for if we once have the length of a cycle we can get the typical (ideal) timing quite accurately as a matter of routine."

"I'm quite impressed by the way the crests of all these cycles bunch." said Robert.

Latitudinal Passage

"Yes." I said, "And if we allow for the fact that cycles seem to come later and later as we find them closer and closer to the equator, the bunching is even more remarkable. The sunspot cycle is found in data that concentrate at about 20° latitude. If we assume the standard rate of slippage as determined by Doctor Wing (½ √2) the crests of a 12.6-year cycle would come 9

O 12.9-YEAR CYCLES



years earlier at the poles than at the equator. In other words, crests of a 12.6-year cycle would come about a year earlier for every 10° of latitude up from the equator. So at latitude 40° we could expect crests to fall almost exactly two years earlier than at 20°. As most of our other data record things happening at about 40° north latitude, we should therefore put the time of a 12.6-year sunspot cycle back two years to make it comparable. If we do this we get its ideal timing (adjusted to 40°) at 1953.8.

"I do not know whether or not we should make a similar adjustment for cotton. If we should, and if the latitude of the cotton market is taken as 30° (New Orleans); we should set the timing of the 12.8-year cycle in cotton prices back one year (to 1954.6) to put it on a 40° latitude basis. This would bunch ideal crests of all seven cycles between 1953.5 and 1954.6. This would be within a span of 1.1 years out of a possible 12 years. You can visualize this tendency for the ideal crests and troughs of all these cycles to come at the same time if you look at these charts. See Fig. 1 on page 183 and the diagram above.

Cycles Bunch

"Figure 1-A diagrams the typical 12.8-year cycle and shows, by solid dots, the time when all seven of the cycles have their ideal times of crest and trough.

"Figure 1-B diagrams the same typical 12.8-year cycle and shows how crests and troughs would fall if they were selected at random. The locations of the dots for Figure 2-B were obtained by pulling out seven slips of paper from a hat in which we had put 128 different numbered slips. Each slip was put back before we drew again."

"Why 128?"

"Because we are measuring to the nearest tenth year. Any given 12.8-year crest can come in any one of 128 (12.8 x 10) different places. Of course if we had made another drawing we would have gotten a different distribution. However, it would have taken thousands of drawings to get, at random, the bunching shown in Figure 1-A."

"What is the diagram?"

The Diagram

"It charts all seven cycles and the cycle in the derived series as well. It shows the length of time over which the cycle has been observed and the ideal timing."

"Why don't you study this series over longer periods of time? Two hundred years isn't very long for a 12-year cycle."

"None of the figures run back farther than I have shown except international battles. I took only 200 years of these figures because that is all I had time to study."

"So What?"

"All that you have told me is most interesting but, as the boys say, 'So what?'"

"Well, I've demonstrated to my own satisfaction that there is probably in nature a cycle about 12 years long and probably another one about 12 3/4-years long (or two, one 12.5 or 12.6, the other 12.8). I think I've built a pretty good case for the idea that the longer one (or ones) is not mere accident. I think we are safe in considering it significant in those places where we find it. I think I've added another building block to the edifice of cycles."

"Yes, I think so too, but I still say, so what?"

"Oh, you mean, what practical use can we put this information to?"

"Yes."

"Well, first of all, we can rely much more strongly on this cycle in those places where we find it, stock prices, copper prices, cotton prices (if it stands up in cotton prices), in war, wheat prices, sales, etc. And second, from the standpoint of our immediate objective we can now use a revised length, strength, and timing, for the "12-year" cycle in stock prices to get a better projection for the next ten or fifteen years."

A New Projection

"Does the difference between 12.0 years and 12.8 years change the projection much?"

"Quite a bit. You see there is a *cumulative* difference of .8 years per wave. The ideal time of the current crest for the 12.8-year cycle is 2.4 years later than it was for the old 12.0-year cycle. That changes the whole synthesis."

"What does the new one look like?"

"Here is the chart of it." See chart on page 176 of *Cycles* for July 1957.

"I suppose one could trade on the 12.8-year cycle by itself?"

"Oh yes, but it wouldn't be very profitable. I've written an article about it if you want further details. See an article called 'The 12.8-Year Cycle in Common Stocks,' in a future issue of *Cycles*.

Thirteen Year Cycles

"Are there any 13-year cycles?" asked Robert.

"Some have been reported."

"Shouldn't you study them too? Mightn't some of them turn out to be 12.8 years long if more carefully measured?"

"Yes, but so far I haven't had the time to do it."

Sunspots With Alternate Cycles Reversed

"Another question: I notice you speak of 'sunspots with alternate cycles reversed.' Do you find this cycle in just ordinary sunspots without reversing alternate cycles?"

"I've never looked for it, but Lane didn't turn up anything of this length in a comprehensive periodic table analysis he made two or three years ago. See G. T. Lane, 'Cycles in Sunspot Numbers' *Journal of Cycle Research,* Vol. 3, No. 1. January 1954. I suspect its only in sunspots when you turn every other 11-year cycle upside down."

"Tell me again why you do this."

"Because the polarity of every other sunspot wave reverses."

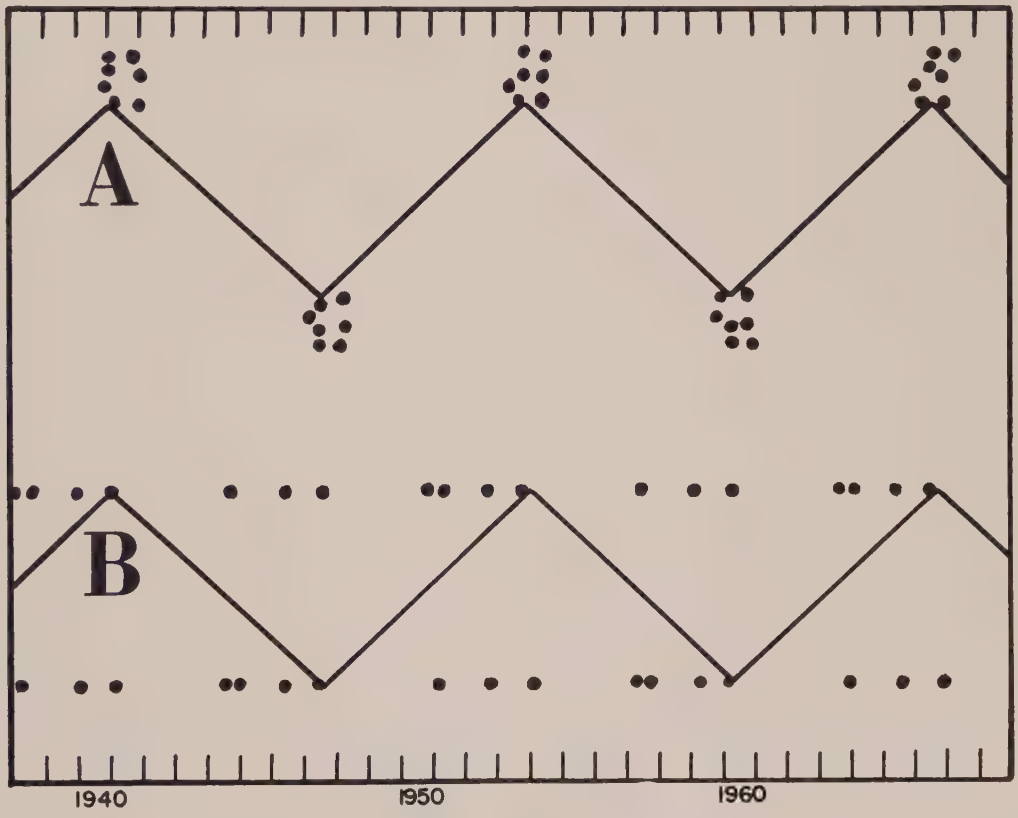


Fig. 1. This diagram shows, in A, how the 12.5 to 12.8-year cycles bunch around typical timing. The little dots represent times of crest and trough as determined for each of seven different cycles. It would be almost impossible to get as much bunching as this just by chance.

To demonstrate this fact I timed seven cycles by drawing numbers out of a hat. Diagram B shows how the crests and troughs fell when they were thus determined.

"That's double talk to me."

"Sunspots generally come in pairs. They act as if they were the poles of great horseshoe magnets buried within the sun. In one 11-year wave in the Northern Hemisphere of the sun the north or positive pole will lead, in the next 11-year wave the south or negative pole will lead. (In the Southern Hemisphere the situation is just the opposite.) These facts have led to the idea that the basic sunspot cycle is 22 years long. This idea is supported by the fact that the cycles we find on earth seem always to have their counterpart in sunspots with alternate cycles reversed, rarely with the sunspot numbers unreversed."

"I still don't get this 'reversed' idea."

"Because the polarity of the leading spot reverses every other 11-year cycle, we call the numbers of every other 11-year cycle negative. It was Anderson's idea. This turns every other wave upside down."

Do Sunspots Cause This Cycle?

"Do you think the cycle in sunspots *cause* the cycle on earth?"

"No, I don't. I think cycles on earth and on the sun are both caused by the same thing--but of course I don't *know*."

"What could that 'thing' be?"

"I don't know, but I've more than a hunch that the wave lengths of these vibrations, whatever they are, are tied up in some way rather closely with the length of time it takes the different planets to go around the sun."

"Have you a theory?" asked Robert.

"Yes," I answered, "but it would take too long to go into now. What do you say we discuss it another time?"

Astronomical Lengths

"All right, but before we leave the subject are there any astronomical lengths you know about in the 12- to 12.9-year range?"

"Well, 12.01 years is 1/7th of the time it takes the planet Uranus to go around the sun; 12.42 years is 1/20 of the time it takes the planet Pluto to go around the sun; 12.46 years is the time it takes for the planets Jupiter and Pluto to line up with each other and the sun; 12.78 years is the time it takes the planets Jupiter and Neptune to line up with each other and the sun."

"These lengths are pretty close to 12.0, 12.5, and 12.8. Could that mean anything?"

"I doubt it, but I don't know." I answered. "And that's a good note to close on. 'I don't know'--(but I'm doing my darndest to find out!)."

Edward R. Dewey

LONG TERM GROWTH TRENDS IN THE AMERICAN ECONOMY*

by Edward R. Dewey

II

Patterns in Growth of Organisms

A GROWTH trend amounts to a pattern; and the pattern is similar for almost all organisms, whether a group of cells in a pumpkin or a group of human beings in a nation. The one has a range of life measured in months, the other in centuries. But the general pattern of growth is much the same. Even more surprising, a similar pattern may be discovered in the growth of human institutions like corporations and industries, as we shall see.

Much of our current knowledge of the laws of growth has developed from the pioneering work of Lowell J. Reed and Raymond Pearl, of Johns Hopkins University. Pearl has briefly described the outcome of their initial research, begun in 1920, as follows:

"As a result of applying certain biological reasoning to the problem, we hit upon an equation to describe the growth of populations, which subsequent work has clearly demonstrated to be a first approximation to the required law. As we were in process of publishing the first discussion of the matter, we found that a Belgian mathematician, P. F. Verhulst, had as early as 1838 used this same curve, which he called the "logistic curve," as the expression of the law of population growth." **

The study which Pearl published in 1925 under the title *The Biology of Population Growth* is still, some thirty years later, a readable, elegantly simple statement of a profound truth which has since been put to work in many fields. The curves Pearl Reed explored permit city planners to forecast future city populations within a small margin of error; enable great utility companies to know with fair accuracy where facilities will be in greatest demand at a given future time. *The Biology of Population Growth* is still required reading for any executive concerned with a scientific approach to the future; a few of its many charts are reproduced here with the publisher's permission.

***The Biology of Population Growth* (p. 3-4., COPYRIGHT, 1925, ALFRED A. KNOPF, INC.

WHILE THERE ARE SCIENTISTS WHO HAVE SHOWN A DISPOSITION TO QUESTION SOME OF THE PEARL METHODS--ON THE GROUND, FOR INSTANCE, THAT HE DID NOT DETERMINE THE PROBABLE ERRORS OF CONSTANTS--AND WHILE ALMOST LIMITLESS WORK IN THIS FIELD IS STILL TO BE DONE, IT REMAINS THAT PEARL'S CONTRIBUTION IS OF EXTRAORDINARY USEFULNESS.

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*A REVISION OF CHAPTERS I-IV OF *Cycles—The Science of Prediction* BY EDWARD R. DEWEY AND EDWIN F. DAKIN, TOGETHER WITH SUPPLEMENTAL MATERIAL.

As Pearl points out, every living being starts as a single cell; the cell divides and is multiplied; the process goes on at different rates but without cessation until complete adult development is reached. Counting the cells is impossible after the very earliest growth stages; but periodically repeated weighings give a rough yet sufficiently accurate index of the increase in their number.

"The results of such periodic weighings give rise, when plotted upon co-ordinate paper, to a curve of peculiarly characteristic shape," Pearl showed. It is something like the shape of an elongated italic ∫. The curve is similar, for instance, for the growth in body weight of a white rate (Fig 1); for the growth in weight of a pumpkin (Fig. 2); and for the growth of a population of yeast cells in a test tube (Fig. 3)

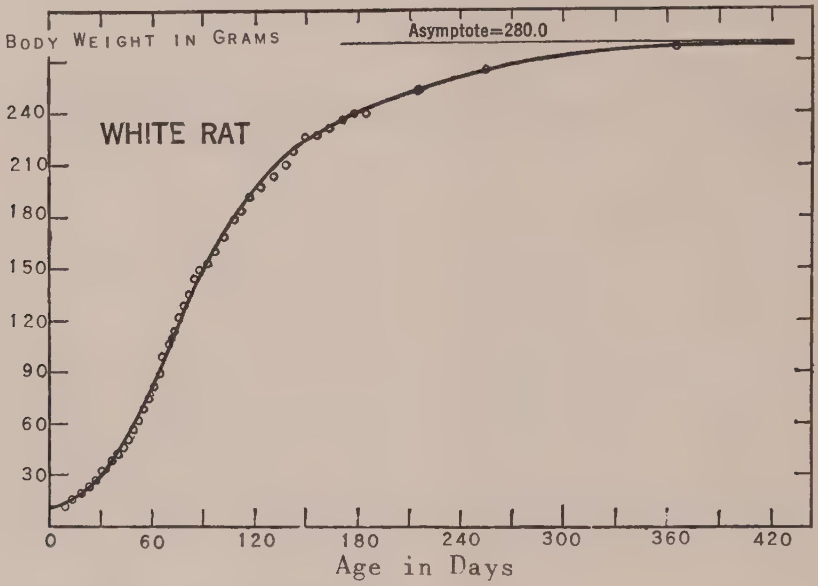

FIG. 1. GROWTH IN BODY WEIGHT OF A MALE WHITE RAT *(After Pearl)*

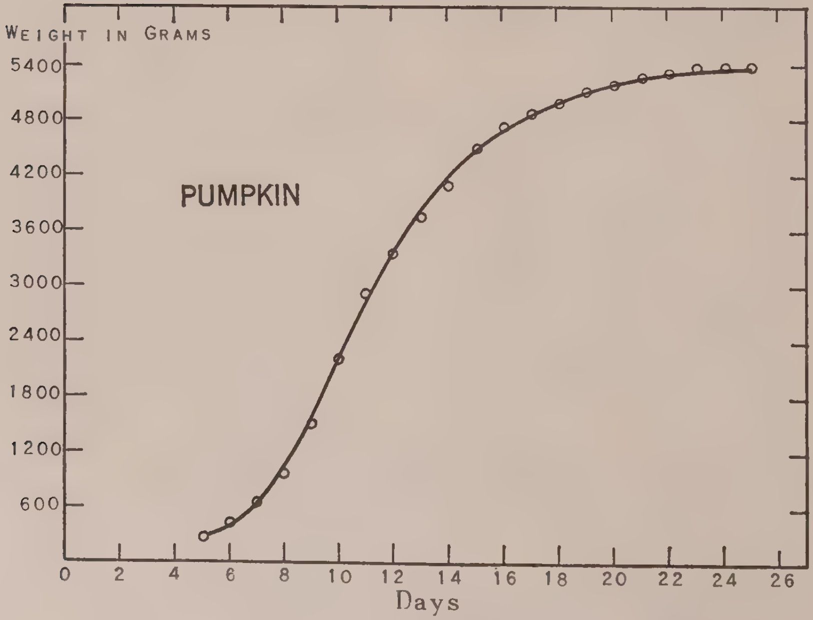

FIG. 2. GROWTH IN WEIGHT OF A PUMPKIN *(After Pearl)*

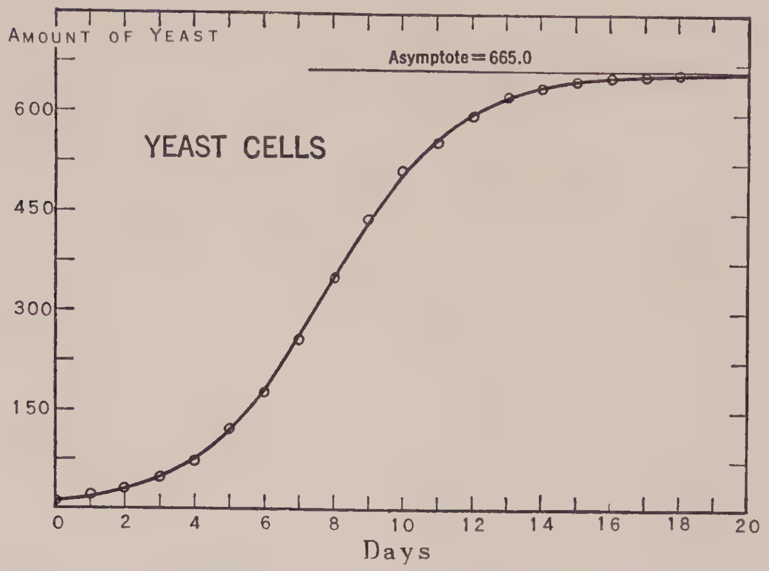

FIG. 3. GROWTH OF A POPULATION OF YEAST CELLS *(After Pearl)*

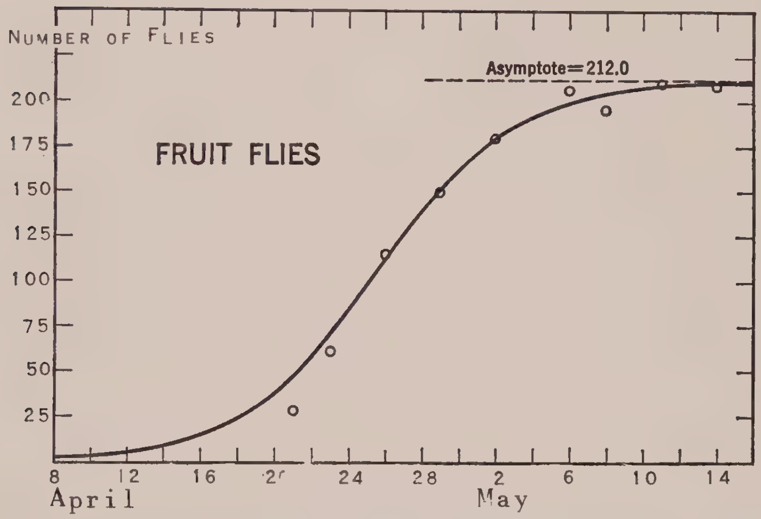

FIG. 4. GROWTH OF A POPULATION OF FRUIT FLIES IN A BOTTLE *(After Pearl)*

and of fruit flies, or *Drosophila,* living *in a bottle (Fig. 4).*

This much seems extremely logical. A population of yeast cells or fruit flies, living in a closed environment, could be expected to reach some upper limit of balance between the number of cells and the living space available. To find a consistent curve in approaching such a balance does not seem surprising. But when Pearl turned to the study of populations, he found the same law of growth operating.

This demonstration does not conform so readily with the processes of our human logic. For human populations are subject to plagues and wars, to emigration and immigration, to birth-control movements and counter birth-control movements. They grow under conditions that seem far removed from the controlled environment of *Drosophila* in a test tube. And yet, as Pearl showed:

"Sweden has grown in a manner which, in

its quantitative relations at least, is essentially like the manner in which a population of yeast cells grows....Except for the amount of time covered by the observations, this curve for the United States is strikingly like that of Sweden For France...the growth has evidently followed, during the epoch...in which it now is, the same basic law as that of Sweden and the United States. The same thing is true of the known population growth of Austria, Belgium, Denmark, England and Wales, Hungary, Italy, Scotland Serbia, Japan, Java, Phillippine Islands, the world as a whole, and Baltimore city."*

The similarities Pearl mentions show up graphically in his charts for Sweden, the United States, and France, reproduced in Figs. 5, 6, and 7.

Now comes a vital and significently useful fact. *When a consistent pattern of growth exists, we have sound grounds for making predictions.* However qualified those predictions may be, they have the probabilities on their side. Thus, when we have enough census records--as for the United States--to establish a number of points on the chart of its population growth, we may observe the pattern of growth that exists; and knowing what the pattern is, we may project it into the future for purposes of prediction.

We may similarly project it into the past. France, for example, is an old nation; but we lack reliable census data for France before 1800. Data available since then, however, are sufficient to create the segment of a curve which may be projected backward as well as forward. The curve for France's present stage of growth had practically reached its upper limit in prewar days, and suggested decline The period of time required by a given nation to go through the familiar pattern of growth varies greatly. With France, the period seems to have been something over four centuries for its current cycle.* But records for Algeria convinced Pearl that this one small country had lived through

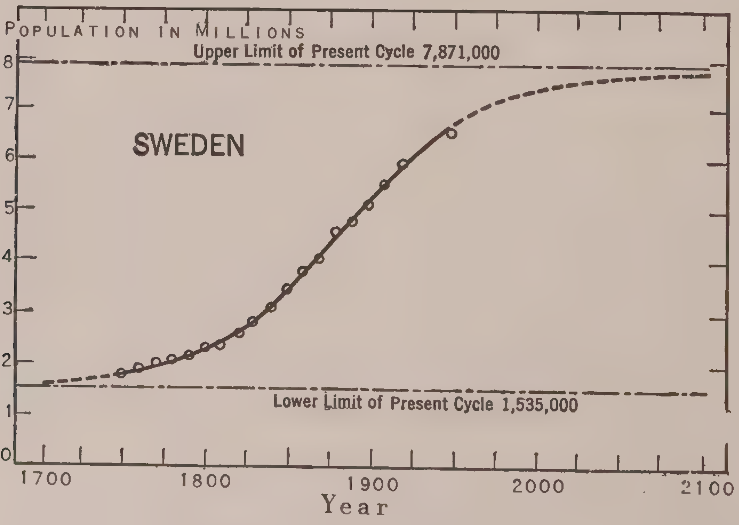

FIG. 5. GROWTH OF THE POPULATION OF SWEDEN

(After Pearl)

**Ibid,* pp. 13.17.

*Earlier, the word *Cycle* was used to describe up and down departures or waves moving around a trend. Here the same word is used to describe a period of growth from youth to maturity. Both uses of the word are correct. *Cycle* comes from a Greek word meaning circle. It implies a coming around again to the place of beginning. Thus, the succession of events from the bottom of one business depression to the bottom of the next depression constitutes a cycle. The succession of events in a growth curve between stability at one level and stability at a higher lever is also a cycle. Later we will use the word in still a third way to refer to *regularly recurring or* rhythmic ups and downs, as in the term *a 9-year cycle*.

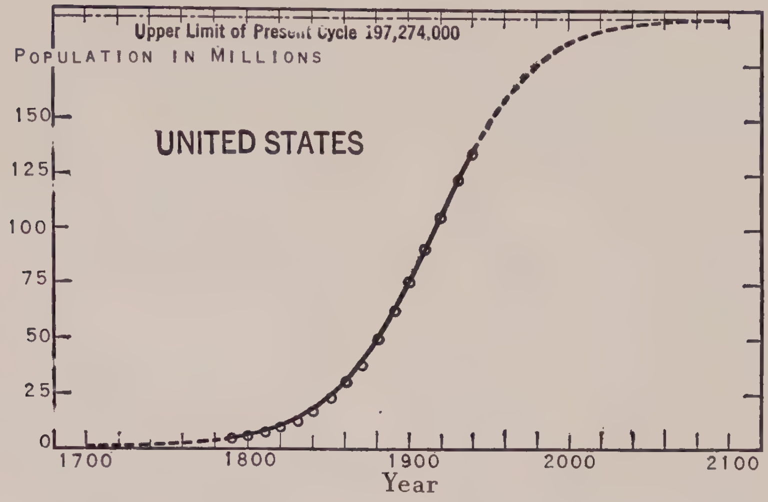

FIG. 6. GROWTH OF THE POPULATION OF THE UNITED STATES *(After Pearl)*

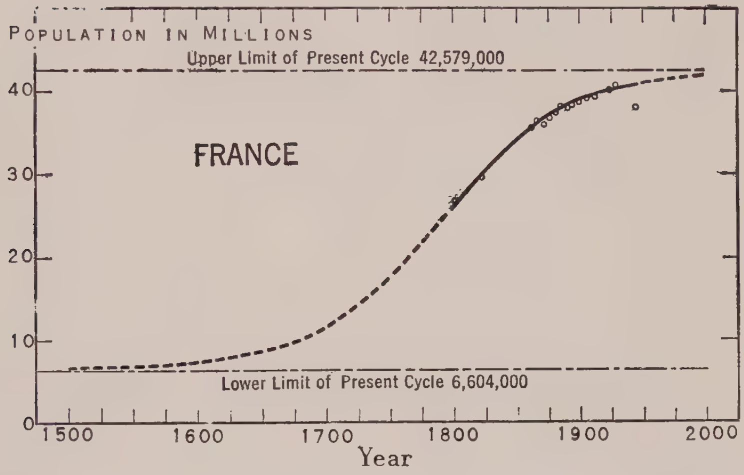

FIG. 7. GROWTH OF THE POPULATION OF FRANCE *(After Pearl)*

almost a complete cycle of growth, from youth to maturity, in less than a hundred years--that cycle comprising the period of open French control following conquest, which seems to have been completed around 1850 (see Fig. 8).

This leads to another striking observation. Algeria was an old country, with an indigenous population, before it was brought under French domination. The introduction of French control apparently launched a new cycle in the nation's life. Alterations in the environment were sufficiently radical to permit a new cycle of population growth to superimpose itself on whatever old one had-existed--one for which we have no census records. When the new trend began, it followed exactly the pattern of expansion we are now familiar with in other countries.

We may thus reach an interesting observation. New cycles of growth may be superimposed upon old ones. We cannot predict when this will happen. Nor can we, as regards humanity, predict the conditions that permit it to happen. But a new cycle can appear when some fundamental change occurs.

If we put our colony of *Drosophila* into a larger bottle, with greater food supplies, a new cycle of growth would begin, but with a pattern quite similar in shape to the old. Similarly, a nation can apparently effect, through a reorganization of its resources, a change in environmental essentials which accomplishes much the same end. It seems to be established, for instance, that the introduction of an industrial economy permits a new rate of population growth substantially in excess of that which was sustained by the community when it was dominantly agricultural.

The world has striking evidence of this in the case of Russia, which following 1917-1918 entered into a new growth cycle. In terms of this new cycle, Russia stands today as the youngest of the great nations in the world. The United States is comparatively an old nation, in the sense of the dynamic forces that are reflected in a rate of growth, biologically and industrially.

Pearl was convinced that a similar new cycle was once evidenced in Germany, where census records go back far enough to permit him to find a modern cycle of growth superimposed on an old one. In the first half of the nineteenth century, Germany's population was reaching the upper level of growth in a cycle that had prevailed since the 1600's. For years the nation had been predominantly agricultural. The abortive democratic revolution of 1848 was coincident with the beginning of a new industrialization, conducted under Prussian leadership, and new political forms. In the twenty years that followed 1850, this industrialization reached a development that permitted the swift defeat of France in 1870. The further unification of Germany that Bismarck then imposed seems merely to have added impetus to the new growth in strength already then established. These events were almost immediately reflected in a rapid increase in the population's rate of growth. The upsurge was clearly in evidence by 1870, and subsequent census figures demonstrated that a new cycle of growth had begun, as shown in Fig. 9.

Germany's new pattern of growth, following 1850, demonstrates an interesting and perhaps significant point, when her population chart is compared with those for England, France, and the United States: Germany in 1914 was in one sense the youngest of these four industrialized nations. This may help account for the extraordinary vitality evidenced by the German people in their rapid rise from their 1918 and 1945 defeats.

For our own purposes here, the past pattern of Germany's population growth is worth noting only because it leads to a conclusion which Pearl phrases succinctly:

"When human social evolution does manage to put a kink in the curve of population growth, it has not done it by altering any biological law. It merely shifts, by a greater or smaller amount, the absolute base from which the law operates. Then the

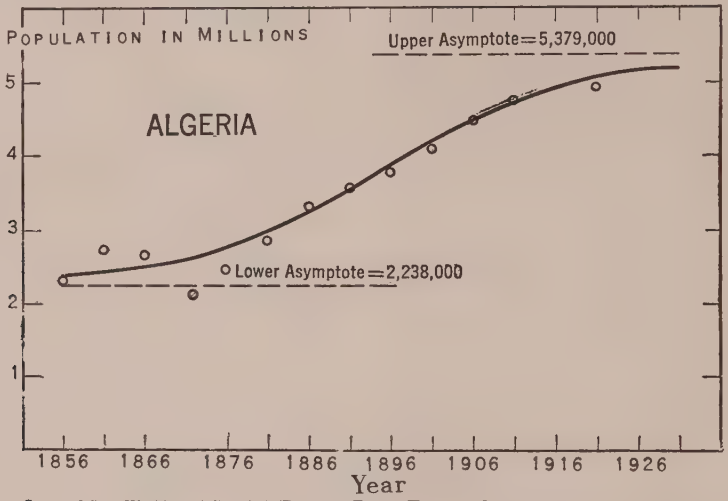

FIG. 8. GROWTH OF THE INDIGENOUS NATIVE POPULATION OF ALGERIA *(After Pearl)*

process goes on as before."*

It is possible to draw another conclusion from which Pearl abstains, but which seems inherent in the data available to us. The renaissance in the pattern of growth apparently does *not* occur, except concurrently with revolutionary changes in the environment. In viewing the United States, we have no grounds for believing that the prevailing trend in our population growth will undergo any material change, unless we simultaneously have grounds for believing that a great revolution in American affairs is due--and a revolution, at that, complete enough to permeate our political, economic, philosophic, and social institutions.

This is exceedingly important to understand, for it has further implications. We are going to discover that patterns of growth in human organisms--an organism like a group of workers associated in an industry--look and act very much like the patterns or trends in population growth. And, in further similarity--these patterns show what we might call an "urge to fulfillment." That is, they are consistent; they do not change capriciously; and *there seems no reason to expect any change unless we also imply a revolution in the constitution of the organism, or in the environment where the pattern is being worked out.*

It may well be that our discovery of how to release atomic energy, or some of our revolutionary new advances in chemistry, which in effect give us new sources of raw material, do herald a fundamental revolution in our society. For instance, Dr. Hornell Hart, Professor of Sociology at Duke University, who believes many of the activities of the human race can be fitted to the Pearl logistic curves, suggests that harnessing of atomic energy may mean a steep upward swing in some of our familiar graphs.* Some may find themselves inclined to agree with him. But it would be some time before we could be statistically sure of any such change. *When a new trend line is superimposed on an old one, the rise will seem to immediate observers like a mere rise in one of the waves that ride on the trend.* Some years would have to pass before we could be certain that any such rise is not just wave like in character, but amounts to a rise in the trend line itself--the imposing of a new, rapidly rising trend line on the old.

Does the rapid growth of the United States in the last few years suggest that a new trend line has been superimposed upon an old one?

A study of long cycles in manufacturing production, suggests that the recent rise could be the result of two or more long cycles acting in unison. My present opinion is that there is as yet no convincing evidence of rebirth of trend in the economy of the United States as a whole.

For the present, at any rate, we shall avoid speculation on matters of this kind, which are still beyond the realm of statistical projection. Our concern here is not with guesses concerning possible new trends in our economy as they might appear in the future, but with study of the established trends as they can be statistically traced right now. In the next chapter these will be spelled out for a number of our basic industries.

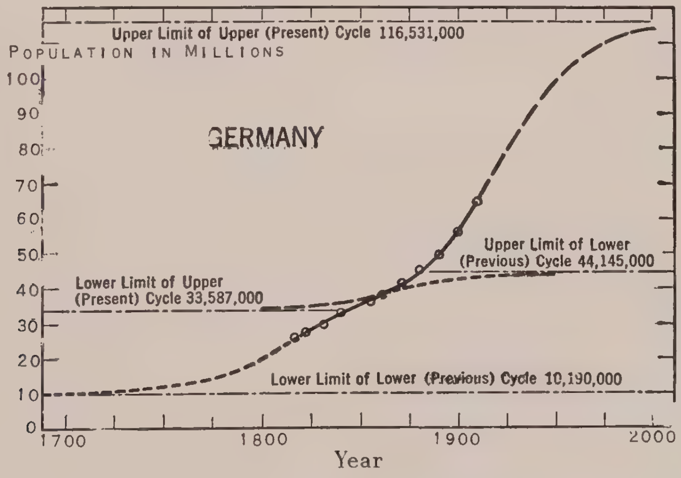

FIG. 9. GROWTH OF THE POPULATION OF GERMANY

This chart (after Pearl) makes apparent two cycles of growth which have overlapped during the period of census history.

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*Ibid, p. 30.

*American Journal of Sociology, June, 1946.

Letters

More Stock Market Cycles

Dear Mr. Dewey:

It is my opinion that we should be a bit more realistic and that your publication should recognize the fact that most subscribers are probably only interested in what your studies indicate as far as the STOCK MARKET goes.

Whether sow's ears will grow longer by 1959, or whether hornet's nests will increase in Wyoming by 1980 is of possible interest to 1 in 1,000,000, but if you would circulate a questionnaire to your subscribers I will wager they would like to have a more frequent and more clarified analysis of the market.

Personally, this is the ONLY reason for my subscription, and I have to really dig through each issue and then try to fathom the possible implications.

I do believe you really have something good - have enjoyed your work since your first book with Dakin - but wish you would stick closer to market *analysis* and market *prediction* - short term and long term. I believe I speak for a majority of subscribers.

Very truly yours,
J. R. Rankin

St. Petersburg, Florida

In Answer I Said:

Dear Mr. Rankin:

I have your interesting letter of May 14. I agree with you fully that the great mass of our readers want to know what's ahead for stocks.

Let me explain why it is often necessary to proceed indirectly.

One of the cycles which I found in 1943 in the stock market seemed to be about 12-years long, but our series of stock market figures is so short that I was not sure of the exact length, strength, and time of this cycle. If I knew the exact length of the cycle, I could find the strength and timing of this cycle in the stock market figures very easily. The question is how to find the length.

The only way I can get this information is by studying this 12-year cycle in other things. What these other things are is completely unimportant as long as I can satisfy myself that they have the same cycle. So far I have found what seems to be the same cycle in battles, in copper prices, and in sunspots. I am still in the middle of this work, but at the moment it looks as if the 12-year cycle in all these things was the same as in stocks and that its length is about 12.8 years.

Thus you see before I can revise my 12-year cycle in stock prices, I have to go far afield.

It should be easy for you to see that for a workable understanding of cycles, we must go even farther afield and learn the laws underlying their behavior. I am no more interested in hog's ears and hornet's nests than you are, but if I could find a cycle in either of them I would gladly study it so as to add to the body of underlying factual information which is indispensable if we are ever really to master the subject of cycles, including cycles in the stock market.

Actually there is little more that I can say about the stock market except, by the methods indicated above, to audit the various cycles already found and to revise the projection by including additional cycles. Both of these things I am endeavoring to do just as fast as money and time permit.

Cycle studies show you the *odds* in favor of this or that. You can read this information right off the charts. However to make it easier for you I have started to give you the odds right in the articles. (See the story on corn prices in the June report for example.) Does this help?

Cordially yours,
Director

THE MODIFIED GEISINGER INDICATOR

THE Modified Geisinger Indicator is a series of numbers which, in the past, have gone up and down ahead of corresponding movements of the Federal Reserve Board Index of Industrial Production. Thd Modified Geisinger Indicator thus throws some light on the probabilities of the future.

The F. R. B. Index of Industrial Production measures physical production in the U. S. A. It is a weighted average of tons, yards, gallons, and numbers of things produced each month.

The Modified Geisinger Indicator is the sum of two Indicators, the Geisinger Indicator and a First Difference Indicator.

The Geisinger Indicator was invented by Robert Geisinger. It is derived from figures which are published each month in the *Survey of Current Business*. It is charted for you as Curve A on pages 114 and 115.

Curve B on these same two pages charts the First Difference Indicator, which is merely the amount by which the smoothed F. R. B. Index is above or below the value for the preceding month. The smoothing is effected by means of a centered 3-month moving average and a 2-month moving average posted to the second position.

Curve C charts the sum of the values of Curves A and B. This curve is called the Modified Geisinger Indicator. It suggests in a general way what the F. R. B. Index may do some eight months later.

Curve D charts the values of the F. R. B Index of Industrial Production.

Curve E re-charts curve C, advancing it by 8 months. This advance is for two reasons (1) so that you can more easily compare the past behavior of the Modified Geisinger Indicator with the behavior of the F. R. B. Index, and (2) so that you can have a better idea of what the F. R. B. Index may do in the future.

FORECAST

INDUSTRIAL Production (Curve D) continues to decline gradually, as expected. Index numbers are given in the table below.

The Geisinger Indicator (Curve A) values for February and March 1957 (October and November 1957 when projected) are -2.6 and -3.2 (preliminary).

The First Difference Indicator (Curve B) continues to decline.

The Modified Geisinger Indicator (Curve C and Curve E) - the sum of the Geisinger Indicator and the First Difference Indicator - also continues to decline. Values for February and March 1957 (October and November 1957 when projected) are -2.93 and -3.86 (preliminary).

Continued caution in regard to the prospects for physical production for the remainder of the year is suggested.

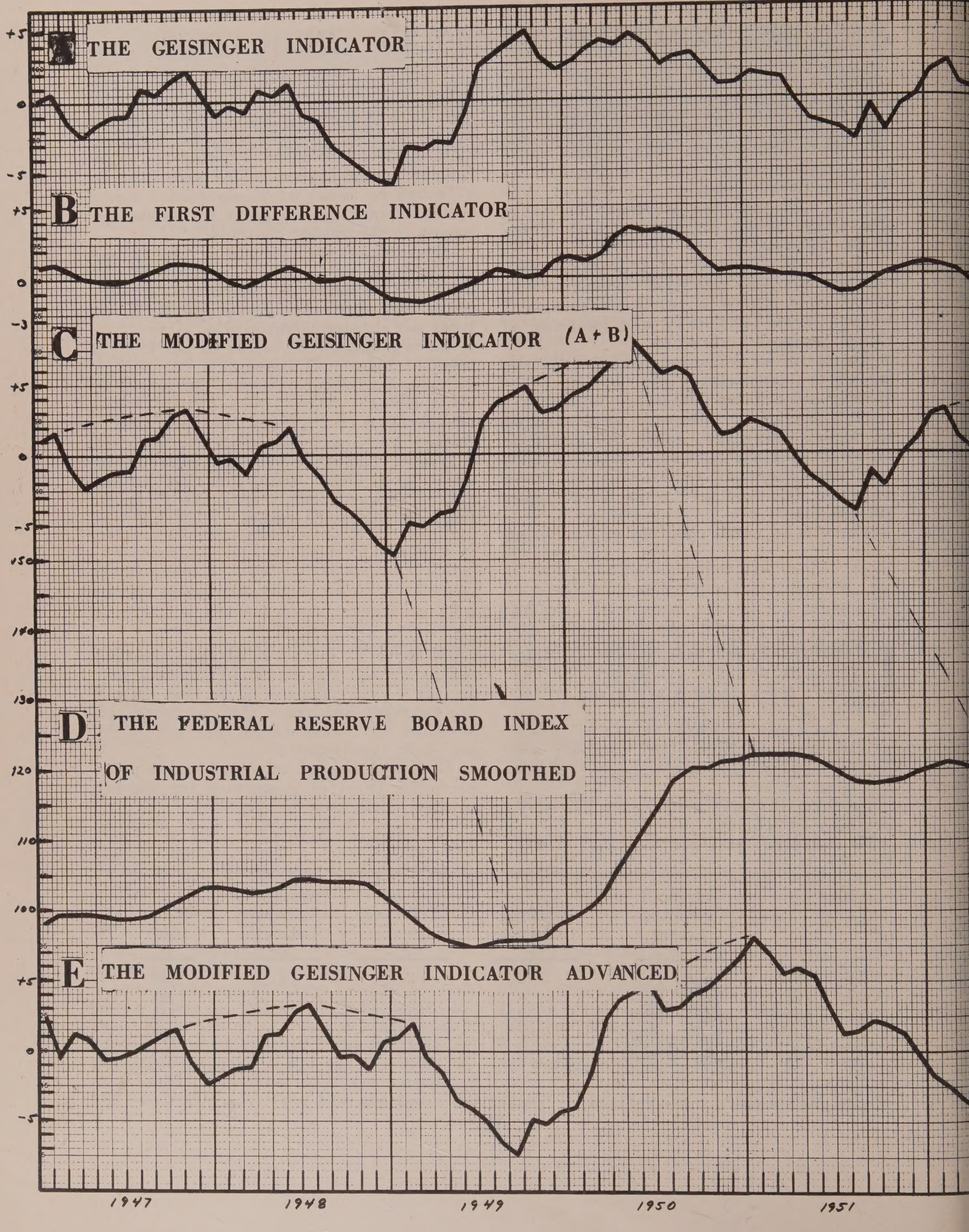
E. R. Dewey

June 27, 1957

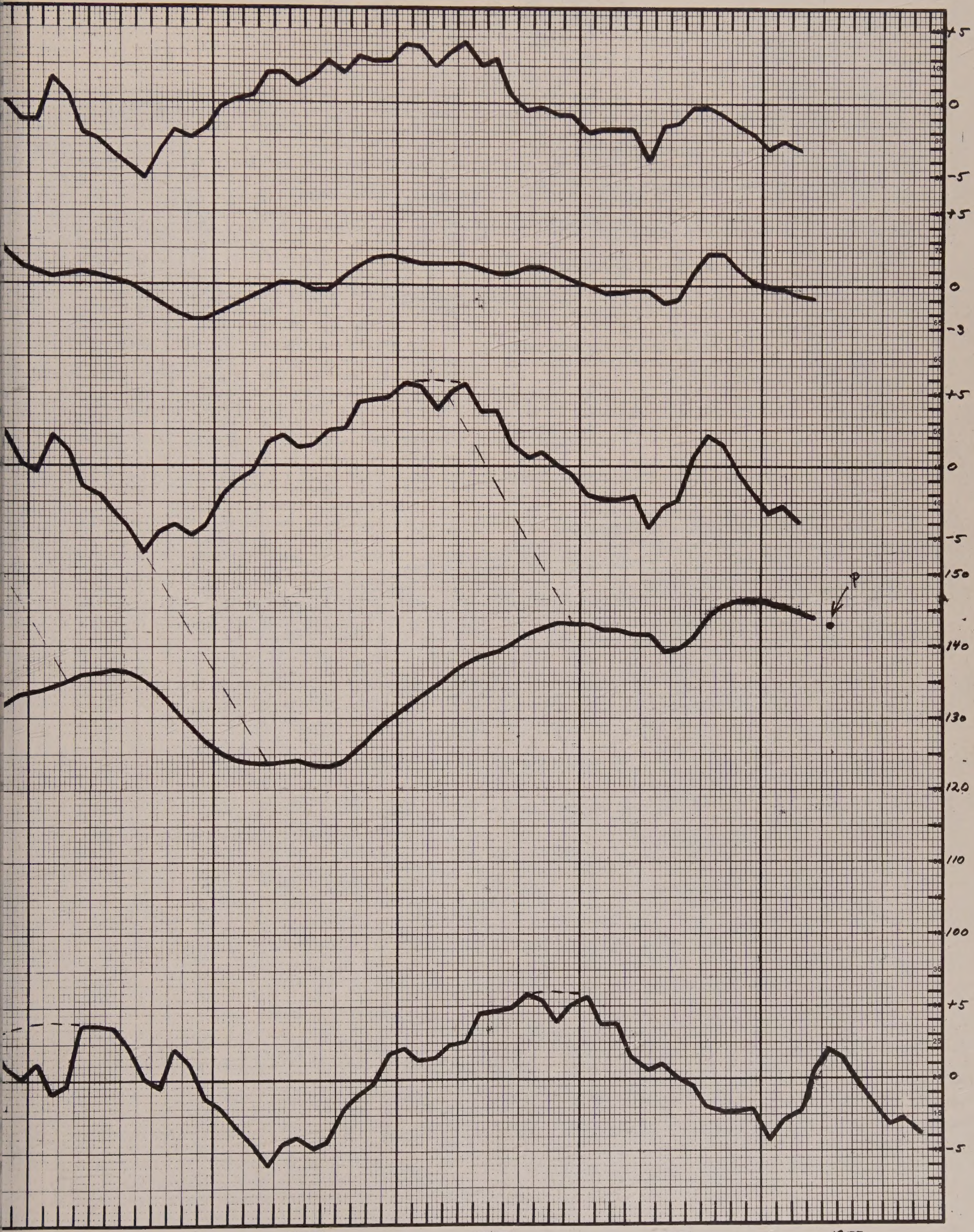
Month	Advanced (8 Months Later)	Geisinger Indicator A	1 st Difference Indicator B	Modified Geisinger Indicator A+B	F.R.B. Index D
Jan. 1957	Sept. 1957	-3.2	0.00	-3.20	146
Feb. 1957	Oct. 1957	-2.6	-0.33r	-2.93	146
Mar. 1957	Nov. 1957	-3.2p	-0.66r	-3.86p	145r
Apr. 1957	Dec. 1957	*	-0.83p	*	144r
May 1957	Jan. 1958	*	*	*	143p

p - preliminary r - revised * - not yet available

THE MODIFIED GEISINGER INDICATOR



OF INDUSTRIAL PRODUCTION



Turn to page 193 for the forecast.

Mr. H. A. Musham
741 No. Rush St.
Chicago, Ill.

GLOSSARY

Cycle, coming from a Greek word meaning circle, implies coming around to the place of beginning. Strictly speaking, in the word itself there is no necessary implication of regularity, but the word is often used loosely to denote rhythm or periodicity.

When the word cycle is modified by a time interval such as 6-year cycle, 20-month cycle, 17-day cycle, the phrase usually means a cycle that recurs with reasonable regularity. In other words, it denotes rhythm.

Rhythm, coming from a Greek word meaning measured time, implies a beat, or a tendency toward perfect regularity or periodicity. It is what we really mean on most of the occasions when we use the word cycle.

Cycle analysis, as we are using the term in this bulletin, should really be called rhythm analysis, as we are concerned with **rhythmic cycles**--cycles that recur with a beat.

Periodicity, in the strict sense, is the quality of being regularly recurrent. It is a quality not often found in nature. The ideal cycles which are often added to a chart to diagram a rhythmic cycle are true periodicities.

A **wave** is one single cycle or undulation. Waves have **frequency**, **amplitude**, **period**, and, at least when they represent harmonic curves, **phase**.

Frequency is the number of complete vibrations to and fro--i.e. waves--per second It is a term not used by cycle analysts when dealing with cycles that are over a second in length.

Amplitude is the extent of a vibratory movement measured from the average position to an extreme position; that is, it is the height or depth of the wave above or below the axis around which the wave oscillates.

Positive amplitude is the distance above the axis, **negative amplitude** is the distance below the axis, **overall amplitude** is the sum of the positive and negative amplitudes. Amplitudes may be expressed in absolute units or as a percentage of the value of the axis.

Period is the interval of time required for a periodic motion to complete a cycle and begin to repeat itself. It is the length of the wave from crest to crest or trough to trough or from some other point on the curve taken as the **epoch**. The **epoch** is the point on the curve chosen as the beginning of the wave. In physics and astronomy it is usually taken as the point where the curve crosses the axis on its upward motion, but it may be any other point as well.

Phase, in a simple harmonic curve, is the point or stage in the period to which the oscillation has advanced considered in relation to a standard position or assumed instant of starting. It is measured along the axis, usually in degrees. By extension of meaning, **positive phase** is therefore the part of the wave above the axis or trend, and **negative phase** is the part of the wave below the axis or trend. When the crests (or troughs) of two or more different series of waves come at the same time, the waves are said to be **in phase** with each other. When the crests of one series of waves coincide with the troughs of another series, the series are spoken of as in **reverse phase**.

A **simple harmonic curve** referred to once or twice above, is the curve you would get by tracing the motion of a pendulum upon a piece of smoked paper that was moving at uniform speed at right angles to the direction in which the pendulum was swaying back and forth. It is perfectly simple, regular, and symmetrical and, in mathematical study, is usually referred to as a **sine curve**. A single oscillation is called a **sine wave**.

A **rectilinear** or **saw-tooth wave**, on the other hand, is a wave the sides of which are straight lines; in other words, zigzag.

Trend is the tendency of data in a series to increase or decrease during a long period of time. The expression, "a long period of time," cannot be defined except relatively. If you are dealing with hourly figures, you might consider trend as the general direction over the past 30 or 40 hours. With yearly figures "trend" might mean the general tendency over the past 100 years or more.

An **average** is a typical value which tends to sum up or describe a number of figures. There are at least five different kinds of averages commonly used by statisticians; but the one which ordinary folk think about when they hear the word **average** is the one computed by adding all the items together and dividing the total by the number of items. Thus, if we have four items, 10, 12, 11, and 13, the average of these items is 10 + 12 + 11 + 13 (46) divided by 4, or 11½. An average of this sort is more accurately called the **arithmetic mean**.

An arrangement of numbers is called a **series**.

When the numbers with which we deal represent events which occur one after another in time, the arrangement is called a **time series**. Thus, in the example above, if 10, 12, 11, and 13 represent the price of cotton for each of four consecutive years, or represent the number of accidents on each of four consecutive days, you would call the numbers by this name--a time series.

You could still average the numbers and say, for example, that the average price for all four years was 11½ cents, or that during the period there was an average of 11½ accidents per day, as the case might be.

You could also say that the average price for the first three years was 11 cents, (10 + 12 + 11 (33) divided by 3) and that the average price for the last three years was 12 cents (22 + 11 + 13 (36) divided by 3).

A **moving average** is a succession of averages secured from a series of numbers by dropping the first number (item) in each group averaged and including the next number in the series after the group, thus obtaining the next group to be averaged, and so on.

Thus, when you averaged the first three numbers of our time series (10, 12, and 11) and got 11, and then dropped the first number (10) and added the fourth number (13) and averaged again and got 12, you were constructing a moving average

Because you were averaging three items at a time, you would call the result a 3-item or 3-term moving average. If the items represented yearly values you would call the result a 3-year moving average. If the items represented daily values, you would call the result a 3-day moving average.

The **moving total** is the series of successive totals from which the moving average is computed. For example: When , above, you added 10, 12, and 11 to get 33, and then added 12, 11, and 13 to get 36 (as a step in the task of getting 11 and 12, the two terms of the moving average), you were computing a moving total.